sity, Montreal, read a paper on 'Radio-active Processes.' According to the report in the London *Times* he pointed out that the radio-active bodies uranium, thorium and radium were continuously and apparently spontaneously giving off three distinct types of radiation. There were, first, the α rays, which were projected bodies, flights of positively charged material particles, which were prominent in causing conductivity in gases, were easily absorbed, moved with great velocity, and carried a large amount of energy. Secondly, there were the β rays, which were apparently the same as the cathode rays of ordinary vacuum tubes, though they traveled faster, and hence had very considerable penetrating powers. They were negatively charged. Thirdly, there were the γ rays, which appeared very similar to ordinary X-rays. In addition some of the substances gave off something else. Thorium oxide, for example, emitted an emanation which appeared to be matter in gaseous state, and could be carried along by air-streams, and radium gave a similar emanation, which differed from that of thorium in that its effects were far more persistent. These emanations behaved like radio-active gases; their diffusion could be measured, and they could be occluded in radio-active bodies, while the fact that they could be condensed by the cold of liquid air rendered them difficult of explanation except on the assumption that they consisted of material bodies. These emanations induced or excited radio-activity in every body in their neighborhood, and this excited activity, like that of the emanations, decayed at a constant rate. Apparently the emanations themselves could not be affected by any chemical treatment, but behaved like inert gases, wherein they differed from the excited activity which chemical treatment did affect. It had been found possible to separate from radio-active bodies a radio-active constituent; thus by a chemical method Crookes had removed all activity from uranium, and the lecturer and Mr. Soddy had found that the radio-active constituent, which might be called thorium X, could be separated from thorium. In time, however, the former lost its activity and the latter regained it. It seemed as if radio-active bodies were continually undergoing some change by which new substances were being produced; thus thorium from which all the thorium X had been removed would in a few weeks yield as much as before. The radiations had a close connection with chemical changes. It might be supposed that the atoms of the radio-active bodies were in a state of unstable equilibrium, and sent off positively charged bodies. But the thorium atom which had sent off such a positive body was chemically altered, and thorium X was equivalent to thorium *minus* the expelled body. The thorium X atom was also unstable, and in turn threw off another positive body, and so the process went on, the changes that occurred being measured by the activity of the preceding stage. The main radio-active processes threw off positive bodies, which were thus the most important, and negative electrons and cathode rays only appeared in the last stages. It was to expected that only a small number of α rays would be thrown off; these were quickly absorbed, and thus the radium was subject to bombardment by itself, with the result that it grew hot and maintained its temperature above that of its surroundings, as observed by Curie. The amount of energy given out was enormous; it might be calculated that a gram of radium during its life would give out enough to raise 500 tons a mile high. But there was no reason why such huge stores of energy should be thought to exist only in radio-active bodies; they might exist in every atom, although we had not yet happened to obtain any knowledge of their existence.

UNIVERSITY AND EDUCATIONAL NEWS.

PRESIDENT BUTLER announced at the commencement exercises of Columbia University that the trustees had decided to purchase the two blocks of land south of the present site of the university at a cost of $2,000,000. He also announced a gift of $300,000 from Mrs. Helen Hartley Jenkins and Mr. Marcellus Hartley Dodge, a member of the senior class,

for a dormitory; and of $100,000 from General Horace W. Charpentier for the School of Law, part of which is to be used for the establishment of special lectures on the science of law.

BOSTON UNIVERSITY has received a gift of $100,000, which will be used to purchase the building on the corner of Somerset street and Ashburton place.

HARVARD UNIVERSITY has established a course in forestry, and Mr. R. T. Fisher has been appointed instructor in this subject.

TRUSTEES have been appointed to the newly organized University of Porto Rico.

UNION COLLEGE is one of the very few reputable institutions which persists in conferring the degree of Ph.D., *honoris causa*. It has conferred the degree this year on one of our most eminent electrical engineers, who is incidentally professor at the college.

A CORRESPONDENT has sent us a circular letter from the American National Nashville College of Law, offering to bestow upon him the degree of Doctor of Laws on the payment of a fee of $10. This extraordinary institution announces that it has increased its authorized capital stock from $10,000 to $20,000 to enable it to offer courses leading to the degrees of D.C.L. and LL.D. It claims to be incorporated by the commonwealth of Tennessee.

AT the commencement exercises of the University of Colorado, at Boulder, degrees were conferred as follows: B.A., 10; B.S., 11; B.Ph., 7; B.S. (C.E.), 5; B.S. (E.E.), 8; M.D., 8; LL.B., 11; M.A., 4. At the same institution Professor R. D. George, assistant professor of geology at the University of Iowa, has been called to a full professorship of geology.

DR. CHARLES S. PALMER has resigned the presidency of the Colorado State School of Mines and will be succeeded by Dean Victor C. Alderson, of the Armour Institute of Technology.

DR. H. B. FINE, professor of mathematics of Princeton University, has been elected dean.

DR. CHARLES PALACHE, assistant professor of mineralogy at Harvard University, and Dr. J. R. Angell, associate professor of experimental psychology at the University of Chicago, will lecture in the summer school of the University of California.

THE following promotions and appointments are announced at Harvard University: Professor Charles R. Sanger, director of the chemical laboratory; Robert W. Willson, professor of astronomy; W. Ernest Castle, assistant professor of zoology; G. W. Pierce and Theodore Lyman, instructors in physics; Assistant Professor H. A. Torrey, of the University of Vermont, instructor in chemistry; J. F. Langmaid, assistant in chemistry; W. S. Tower, assistant in physiography and meteorology; J. M. Greenman, instructor in botany.

DR. FREDERICK NEHER and Dr. Alexander H. Phillips, of Princeton University, have been promoted to professorships of analytical and organic chemistry and of mineralogy respectively.

DR. J. HEATH BAWDEN has been promoted to the professorship of philosophy, Vassar College.

JOSEPH E. KIRKWOOD, Ph. D. (Columbia), instructor in botany, and Albert M. Reese, Ph.D. (Johns Hopkins), instructor in histology and embryology, have been promoted to associate professorships in Syracuse University.

THE following appointments have been made in the Chemical Department of the University of North Carolina for the session 1903–4: R. O. E. Davis, Ph.D, instructor; W. McKim Marriotte and L. B. Lockhart, assistants; Reston Stevenson, M.A. (North Carolina), has accepted a position of assistant in chemistry, Cornell University; H. H. Bennett, Ph.B., assistant in chemistry, has accepted an assistantship in the Soil Survey Laboratory, Washington, D. C.

MISS ONERA A. MERRITT, who holds degrees from Birmingham and London Universities, has been appointed instructor in zoology at Wellesley College.

F. A. SAGER, assistant professor of physics in the University of Illinois, has resigned.